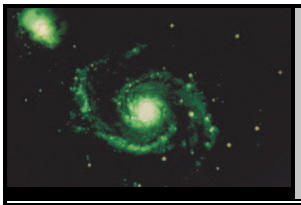


The Prairie Astronomer

The Official Newsletter Of The Prairie Astronomy Club, Inc.

February 2004 **Volume 45 Issue #2**

Internet Addresses

PAC Web Page:	www.prairieastronomyclub.org
PAC E-Mail:	info@prairieastronomyclub.org
NSP Web Page:	www.nebraskastarparty.org
NSP E-Mail:	nsp@4w.com
OAS Web Page:	www.OmahaAstro.com
Hyde Observatory	www.hydeobservatory.info
NEB-STAR	www.neb-star.org

CLUB EVENTS

Club Star Party
Friday, February 20, 2004

PAC Meeting 7:30pm
Tuesday, February 24, 2004

Club Star Party
Friday, March 19, 2004

PAC Meeting 7:30pm
Tuesday, March 30, 2004

Astronomy Day
Sunday, April 18, 2004

Nebraska Star Party
Friday, July 18-23, 2004

PROGRAM

February program: Learn How to Use Your Telescope

Note: changes in email addresses:

The PAC Email address is now info@ prairieastronomyclub.org instead of pac@4w.com.

The PAC-LIST address has also been changed.

PAC-LIST: You may subscribe to the PAC listserv by sending an e-mail message to: **imailsrv@prairieastronomyclub.org**. In the body of the message, write "Subscribe PAC-List your-email-address@your-domain.com"

For example:
Subscribe pac-list stargazer@myISP.com

To post messages to the list, send to the address **pac-list@prairieastronomyclub.org**

READ THIS NEWSLETTER ONLINE

Those who wish to help with publishing and postage costs by receiving only the on-line version of the newsletter should contact Liz Bergstrom at 464-2038. Mark Dahmke or Liz can give you the logon account and password for access. You may receive both the mailed version and the on-line version if you wish. A printable PDF version of this newsletter is also available through the website.

CONTENTS:

The Prairie Astronomer is published monthly by the Prairie Astronomy Club, Inc. Membership expiration date is listed on the mailing label. Membership dues are: **Regular $20/yr, Family $22/yr**. Address all new memberships and renewals to: **The Prairie Astronomy Club, Inc., PO Box 5585, Lincoln, NE 68505-0585**. For other club information, please contact one of the club officers listed on the last page of this newsletter. Newsletter comments and articles should be submitted to: **Mark Dahmke, PO Box 80266, Lincoln, NE 68501 or mdahmke@4w.com,** no less than ten days prior to the club meeting. The Prairie Astronomy Club meets the last Tuesday of each month at Hyde Memorial Observatory in Lincoln, NE.

Secretary's Report — Lee Taylor

Prairie Astronomy Club Minutes

The January meeting was cancelled due to weather.

Hyde Observatory Volunteer Schedule

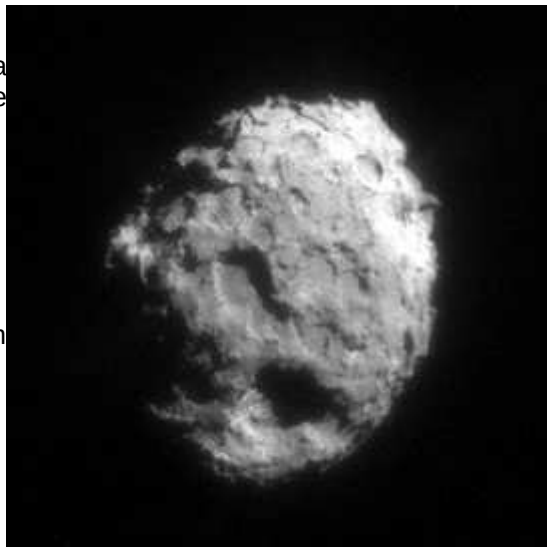
Date	Team Leader	Operators		Supervisor	Events
February					
2/7/04	Jeff King	Mary Winquest	Jeff Campbell	Brian Sivill	
2/14/04	Bob Leavitt	Joey Churilla	Erica Block	Dave Churilla	
2/21/04	Bill Wells	Karla Bachman	Cece Hedrick	Rick Johnson	
2/28/04	Dan Delzell	Jared Delzell	Josh Machecek	Dave Hamilton	
March					
3/6/04	Bill Wells	Josh Machecek	Karla Bachman	Brian Sivill	
3/13/04	Jeff King	Joey Churilla	Steve Lloyd	Dave Churilla	
3/20/04	Dan Delzell	Jared Delzell	Jeff Campbell	Dave Hamilton	
3/27/04	Bob Leavitt	Mary Winquest	Erica Block	Rick Johnson	
Summer Hours: April through September (Sundown to 11:00 PM)					
Winter Hours: October through March (7:00 PM to 10:00 PM)					

Stardust's Flyby Surprise

On Jan. 2nd, 2004, NASA's Stardust spacecraft approached Comet Wild 2 and flew into a storm. Flurries of comet dust pelted the craft. At least half a dozen grains moving faster than bullets penetrated Stardust's outermost defenses. The craft's 16 rocket engines struggled to maintain course while a collector, about the size of a tennis racquet, caught some of the dust for return to Earth two years hence.

All that was expected.

Then came the surprise. It happened when Stardust passed by the core of the comet, only 236 km distant, and photographed it using a navigation camera. The images were intended primarily to keep the spacecraft on course. They also revealed a world of startling beauty.



Right: The nucleus of Comet Wild 2 photographed by Stardust with approximately 20 meter resolution.

At the heart of every comet lies a "dirty snowball," a compact nucleus of dust and ice that the sun vaporizes, little by little, to form the comet's spectacular tail. These nuclei are hard to see. For one thing, most are blacker than charcoal; they reflect precious little sunlight for cameras. Plus they're hidden deep inside a cloud of vaporizing gas and dust, called "the coma." Stardust's plunge into Wild 2's coma allowed it to view the nucleus at close range.

Previous flybys of Comet Halley by the European Giotto probe and Comet Borrelly by NASA's Deep Space 1 revealed lumpy cores without much interesting terrain--as expected.

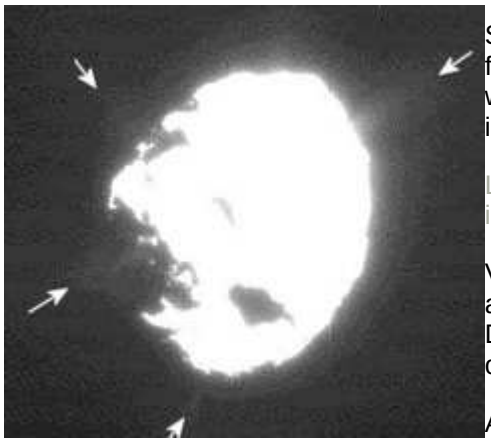
These comets have been sun-warmed for many thousands of years. Solar heating has melted away any sharp features.

Comet Wild 2, however, looks different. "We were amazed by the feature-rich surface of the comet," says Donald Brownlee of the University of Washington, the mission's principal investigator. "It is highly complex. There are barn-sized boulders, 100-meter high cliffs, and some weird terrain unlike anything we've ever seen before. There are also some circular features," he adds, "that look like impact craters as large as 1 km across."

"The high cliffs tell us that the crust of the comet is reasonably strong," notes Brownlee. It's probably a mixture of fine-grained rocky material held together by frozen water, carbon monoxide and methanol. Certainly a lander could touch down there, or an astronaut could walk across the surface without worrying too much about the ground collapsing.

An astronaut standing on Comet Wild 2 would see a truly fantastic landscape, speculates Brownlee. "I imagine them inside one of the craters, surrounded by deep cliffs." Icy spires, as tall as a person, might rise out of the crater floor. "These would be be the comet-equivalent of 'snow spikes' on Earth--those little jagged ridges that form when snow is exposed to sunlight and melts."

Getting out of the crater would be easy. "Just jump," says Brownlee, "but not too hard." The comet's gravity is only 0.0001-g, so "you could easily leap into orbit."



Some of the photos from Stardust reveal gaseous jets. "The jets come from active regions on the comet's surface, fissures or vents probably, where the ice is vaporizing and rushing into space," Brownlee says. This is how mass is transferred from the comet's nucleus to its tail.

Left: Long exposure images of Wild 2's nucleus reveal faint jets indicated by arrows. Credit: NASA/Stardust.

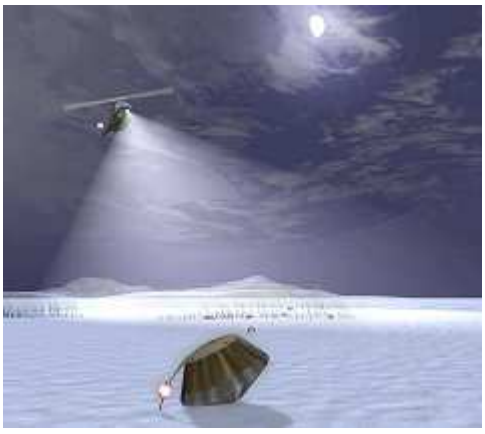
Viewed from the surface, the jets would be nearly transparent. But an astronaut could spot them by looking for "dust entrained with the gas. Dust grains glinting in the sunlight would look like tracer bullets shooting out of the ground."

A careful explorer could survey the entire 5-km nucleus in only a few hours, leaping high above the surface, dodging the occasional jet. "What an experience that would be," he says.

There are billions of comets in the solar system. "We've gotten a close-up look at only three," says Brownlee. And one of the three, Comet Halley, presented its night side to the cameras. So it's too soon to say whether Comet Wild 2, among comets, is truly unusual.

Unlike comets Halley and Borrelly, notes Brownlee, "Wild 2 is a very recent arrival to the inner solar system." For billions of years it orbited in the cold deep space beyond Jupiter, until 1974 when it was nudged by Jupiter's gravity into a sun-approaching orbit. Since then the comet has passed by the Sun only five times; solar heating is only beginning to mold its surface.

And, according to Brownlee, that might be the key to the comet's appearance. "Wild 2's surface is a mixture of young and old that we haven't see before," he explains. Young features include possible sinkholes collapsing as the terrain is warmed. Impact craters and their ejecta, on the other hand, are old scars from time spent in the outer solar system.



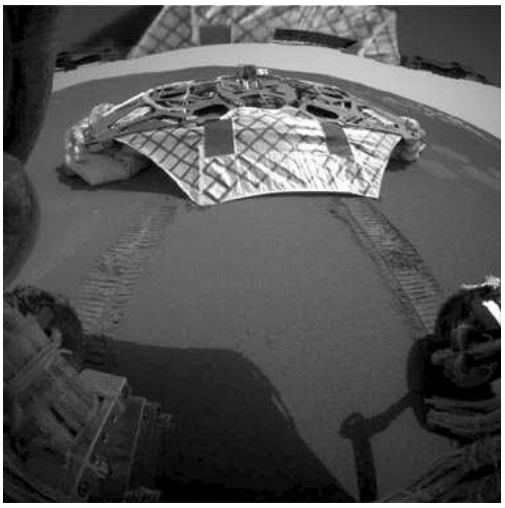
Right: Inside a tiny Apollo-style capsule, samples from Comet Wild 2 will return to Earth in 2006.

The old parts of Wild 2 are what make the comet an attractive target for the Stardust probe, which captured a thousand or more grains of comet dust during the flyby. Such material, little altered since the formation of the solar system, could tell us a great deal about our origins.

The craft's payload will return to Earth in 2006 for analysis by scientists. If a single picture from the navigation

camera can surprise researchers, just imagine what's in store when they get their hands on a thousand pieces of the comet itself.

Opportunity Rolls onto Martian Ground



Opportunity looks back at its lander.

NASA's Mars Exploration Rover Opportunity drove down a reinforced fabric ramp at the front of its lander platform and onto the soil of Mars' Meridiani Planum this morning.

Also, new science results from the rover indicate that the site does indeed have a type of mineral, crystalline hematite, that was the principal reason the site was selected for exploration.

Controllers at NASA's Jet Propulsion Laboratory received confirmation of the successful drive at 3:01 a.m. Pacific Standard Time via a relay from the Mars Odyssey orbiter and Earth reception by the Deep Space Network. Cheers erupted a minute later when Opportunity sent a picture looking back at the now-empty lander and showing wheel tracks in the martian soil.

For the first time in history, two mobile robots are exploring the surface of another planet at the same time. Opportunity's twin, Spirit, started making wheel tracks halfway around Mars from Meridiani on Jan. 15.

"We're two for two! One dozen wheels on the soil." JPL's Chris Lewicki, flight director, announced to the control room.

Matt Wallace, mission manager at JPL, told a subsequent news briefing, "We knew it was going to be a good day. The rover woke up fit and healthy to Bruce Springsteen's 'Born to Run,' and it turned out to be a good choice."

The flight team needed only seven days since Opportunity's landing to get the rover off its lander, compared with 12 days for Spirit earlier this month. "We're getting practice at it," said JPL's Joel Krajewski, activity lead for the procedure. Also, the configuration of the deflated airbags and lander presented no trouble for Opportunity, while some of the extra time needed for Spirit was due to airbags at the front of the lander presenting a potential obstacle.

Looking at a photo from Opportunity showing wheel tracks between the empty lander and the rear of the rover about one meter or three feet away, JPL's Kevin Burke, lead mechanical engineer for getting the rover off the lander, said "We're glad to be seeing soil behind our rover."

JPL's Chris Salvo, flight director, reported that Opportunity will be preparing over the next couple days to reach out with it robotic arm for a close inspection of the soil.

Gray granules covering most of the crater floor surrounding Opportunity contain hematite, said Dr. Phil Christensen, lead scientist for both rovers' miniature thermal emission spectrometers, which are infrared-sensing instruments used for identifying rock types from a distance. Crystalline hematite is of special interest because, on Earth, it usually forms under wet environmental conditions. The main task for both Mars Exploration Rovers in coming weeks and months is to read clues in the rocks and soil to learn about past environmental conditions at their landing sites, particularly about whether the areas were ever watery and possibly suitable for sustaining life.

The concentration of hematite appears strongest in a layer of dark material above a light-covered outcrop in the wall of the crater where Opportunity sits, Christensen said. "As we get out of the bowl we're in, I think we'll get onto a surface that is rich in hematite," he said.

JPL, a division of the California Institute of Technology in Pasadena, manages the Mars Exploration Rover project for NASA's Office of Space Science, Washington, D.C. Images and additional information about the project are available from JPL at http://marsrovers.jpl.nasa.gov and from Cornell University, Ithaca, N.Y., at http://athena.cornell.edu.

Looking for Signs of Water on Mars

The big science question for the Mars Exploration Rovers is how past water activity on Mars has influenced the red planet's environment over time. While there is no liquid water on the surface of Mars today, the record of past water activity on Mars can be found in the rocks, minerals, and geologic landforms, particularly in those that can only form in the presence of water. That's why the rovers are specially equipped with tools to study a diverse collection of rocks and soils that may hold clues to past water activity on Mars.

The rovers will offer unique contributions in pursuit of the overall Mars science strategy to "Follow the Water." Understanding the history of water on Mars is important to meeting the four science goals of NASA's long-term Mars Exploration Program:

- Determine whether Life ever arose on Mars
- Characterize the Climate of Mars
- Characterize the Geology of Mars
- Prepare for Human Exploration

Objectives:

The scientific objectives of the Mars Exploration Rover mission are to:

1. Search for and characterize a variety of rocks and soils that hold clues to past water activity. In particular, samples sought will include those that have minerals deposited by water-related processes such as precipitation, evaporation, sedimentary cementation, or hydrothermal activity.
2. Determine the distribution and composition of minerals, rocks, and soils surrounding the landing sites.
3. Determine what geologic processes have shaped the local terrain and influenced the chemistry. Such processes could include water or wind erosion, sedimentation, hydrothermal mechanisms, volcanism, and cratering.
4. Perform "ground truth" -- calibration and validation -- of surface observations made by Mars orbiter instruments. This will help determine the accuracy and effectiveness of various instruments that survey Martian geology from orbit.
5. Search for iron-containing minerals, identify and quantify relative amounts of specific mineral types that contain water or were formed in water, such as iron-bearing carbonates.
6. Characterize the mineralogy and textures of rocks and soils and determine the processes that created them.
7. Search for geological clues to the environmental conditions that existed when liquid water was present. Assess whether those environments were conducive to life.

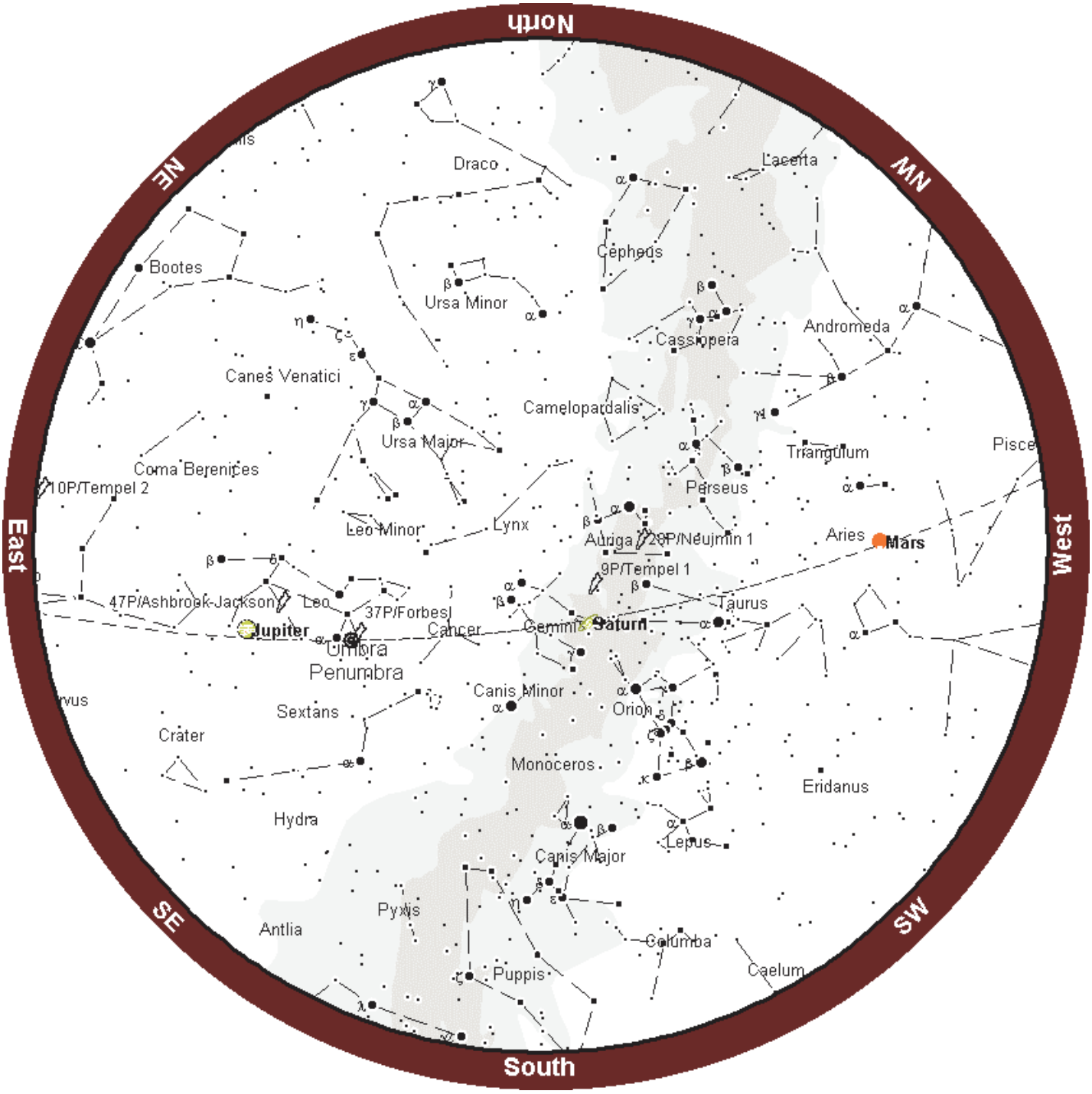
How scientists will rely on the rovers to look for signs of past water

Because scientists cannot go to Mars themselves at this point in time, they will have to rely on robot geologists -- the rovers -- to look for signs of past water activity on Mars for them.

To do their job, the rovers will carry a number of science instruments that will analyze rocks and soils on the Martian surface and perform other important tasks and studies.

To learn more about this mission, please visit:
http://marsrovers.jpl.nasa.gov/science/

February Star Chart



Events Calendar

March 2004						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 Sun: 06:59 - 18:17	2 Sun: 06:58 - 18:18	3 Sun: 06:56 - 18:19 Jupiter at opposition	4 Sun: 06:55 - 18:20	5 Sun: 06:53 - 18:21	6 Sun: 06:52 - 18:22 Hyde Observatory open to the public
7 Sun: 06:50 - 18:23	8 Sun: 06:48 - 18:25	9 Sun: 06:47 - 18:26	10 Sun: 06:45 - 18:27	11 Sun: 06:43 - 18:28	12 Sun: 06:42 - 18:29	13 Sun: 06:40 - 18:30 Hyde Observatory open to the public
14 Sun: 06:39 - 18:31	15 Sun: 06:37 - 18:32	16 Sun: 06:35 - 18:33	17 Sun: 06:34 - 18:34	18 Sun: 18:33 - 06:36	19 Sun: 18:31 - 06:37 Club Star Party	20 Sun: 18:30 - 06:38 Hyde Observatory open to the public
21 Sun: 18:28 - 06:39	22 Sun: 18:26 - 06:40	23 Sun: 18:25 - 06:41	24 Sun: 18:23 - 06:42	25 Sun: 18:21 - 06:43	26 Sun: 18:20 - 06:45	27 Sun: 18:18 - 06:46 Hyde Observatory open to the public
28 Sun: 18:16 - 06:47	29 Sun: 18:15 - 06:48 Mercury and Venus greatest elongation	30 Sun: 18:13 - 06:49 PAC Meeting 7:30pm	31 Sun: 18:11 - 06:50			

Moon phase images by: António Cidadão

Directions to Olive Creek Observing Site

Shorter:

Take Hwy 77 South out of Lincoln until you get to the Crete corner (junction Hwy 77 and Hwy 33). Go West on Hwy 33 (toward Crete) until you get to SW 72 St. Turn Left (South) on SW 72 St. and go about 5 miles until you get to SW Panama Rd. Turn right (West) until you get to SW 100 St. (SW 100 St does NOT go through to Hwy 33). Turn Left (South) on SW 100 St and go about 1 to 1 1/2 miles until you see the sign and entrance to Olive Creek (this is the West side of the Park). It's on your left (East) side of the road. More Black Top:

Take Hwy 77 South out of Lincoln until you get to the Crete corner (junction Hwy 77 and Hwy 33). Go West on Hwy 33 (toward Crete) until you get to about SW 114 St. - the first intersection after SW 100 St. (forgot to look at this street sign, sorry - you'll see a sign for Olive Creek though at this road- but don't count on anymore signs after that, I didn't see any). Turn Left (South) on SW 114 St and go about 5 miles or so until you get to SW Panama Rd (you'll see a church and small school on your right). Turn Left (East) and go about a mile to SW 100 St, then turn Right (South) and go 1 to 1 1/2 miles until you see the Olive Creek entrance and sign (on your left hand side of the road).

OFFICERS
OF THE PRAIRIE ASTRONOMY CLUB

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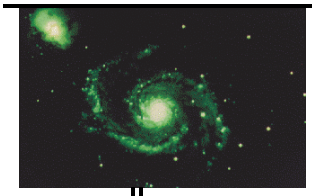

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c/o The Prairie Astronomy Club, Inc.
P.O. Box 5585
Lincoln, NE 68505-0585

First Class Mail

Next PAC Meeting
February 24, 2004
7:30 PM
Hyde Observatory